

REMARKS

1. The Rejections Under §102(b) Based on Gundlach.

Claims 28 to 31, 33 to 37, 42, 43, 46 and 47 stand rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent No. 5,966,105 to Gundlach. According to the Office, “Gundlach teaches an enclosure, a frame adapted to hold an interlaced image 20a, and an optical barrier comprising grills 22.” Office Action at p. 2.

Claim 28 has been amended to recite that the frame is adapted to hold an interlaced image, with the interlaced image being defined by a plurality of images, each of the plurality of images being defined by a plurality of strips, the interlaced image being defined by a plurality of sets of the strips, each set including a strip from each of the plurality of images. The claim has also been amended to recite that the grills are arranged to define a plurality of substantially parallel elongated gaps between adjacent grills through which portions of the installed interlaced image can be viewed by a viewer, with the ratio of grill width to gap width being about 80:20 with a variance of up to 5%. Finally, the claims have been amended to recite that at least part of one strip of an installed interlaced image and at least part of an adjacent strip can be viewed by a viewer through each gap at any one time, so that the installed interlaced image in conjunction with the optical barrier display 3D images to a the viewer.

Gundlach does not disclose the features claimed by applicant's amended claims. As one clear example, Gundlach does not disclose a grill width to gap ration of 80:20 with a variance of up to 5%. Additional differences between the amended claim and the Gundlach reference will be discussed below.

Support for the amendments to claim 28 are as follows. With respect to the amendment to recite "the interlaced image [is] defined by a plurality of images; each of the plurality of

images [is] defined by a plurality of strips, the interlaced image [is] defined by a plurality of sets of the strips, [and] each set [includes] a strip from each of the plurality of images," support for the amendment can be found, for example, in figures 6A and 6D and at paragraph [0035]. With respect to the amendment to recite "the grills [of the optical barrier are] arranged to define a plurality of substantially parallel elongated gaps between adjacent grills through which portions of the installed interlaced image can be viewed by a viewer, a ratio of grill width to gap width being about 80:20 with a variance of up to 5%," support for the above amendment can be found, for example, in figures 6A to 6D and at paragraph [0033]. With respect to the amendment to recite "wherein at least part of one strip of an installed interlaced image and at least part of an adjacent strip can be viewed by a viewer through each gap at any one time, so that the installed interlaced image in conjunction with the optical barrier display 3D images to a the viewer," support for the above amendment can be found, for example, in figures 6A to 6D and at paragraphs [0033], [0035] and [0036]. More particularly, at paragraph [0033], the present invention recites a grill width to gap [spacing] width ratio of 80:20, with a tolerable variance of up to 5%. The 80:20 ratio is shown in figures 6A to 6D. At paragraphs [0035] and [0036], the description recites that the width of each set of strips of the interlaced image matches the width of one grill plus the width of the gap to an adjacent grill. Further at paragraphs [0035] and [0036], the description recites 10 to 25 strips make up each set. As shown in figures 6A to 6D, the described apparatus having these relative ratios and relationships result in the claimed arrangement of "at least part of one strip of an installed interlaced image and at least one part of an adjacent strip [being able to be] viewed by a viewer through each gap at any one time".

In view of the above, it is respectfully submitted that the rejection under §102(b) should be withdrawn.

2. The Rejections Under §103.

Claims 32, 38 to 41 and 44 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Gundlach in view of U.S. Patent No. 6,476,850 to Erbey. According to the Office, the functionality of the claimed features is identical to that of the cited references, and it is well established that further optimization of specific dimensions and proportions is either the result of ornamental design or routine experimentation which is within the capabilities of one of ordinary skill in the art.

Applicants traverse the stated rejection because the facts of this case are that at least some of the claimed features provide unexpected and significant advantages that are not taught or suggested by the prior art. In particular, the present invention uses the claimed interlaced images in conjunction with the claimed optical dimensions to provide a simple solution for displaying 3D images to a viewer viewing the image through the gaps between the grills of the optical display without the need for lenticular and gradient lenses and without the need for viewing equipment such as goggles. A viewer moving laterally past the optical barrier and viewing the interlaced image through the gaps perceives that they are viewing an image at different angles. This unexpected visual effect enables 3D billboard-size images, for example, to be simply and cheaply displayed to viewers. In a typical 6 meter-wide billboard embodiment of the present invention, for example, it has been found that an interlaced image can be viewed in 3D by a viewer moving from a minimum of 5 meters to the limit of the viewer's vision away from the billboard. That effect is not provided by the prior art, nor does the prior art teach or suggest that the effect may be obtained by routine experimentation or optimization.

Because the claimed features provide an unexpected advantage that is not predicted by the prior art, and because the unexpected advantage is obtained by the use of specific parameters

that cannot be obtained by routine experimentation or optimization, the claimed invention is not made obvious by the cited art and the rejection under §103(a) should be withdrawn.

3. Other Comments Relating to the Patentability of the Claimed Invention.

To further highlight the points made above, additional discussion of the claimed invention and the differences between it and the cited art are provided herein.

Initially, it should be recognized that Gundlach seeks to provide (1) raster displays that can be used in brighter ambient conditions, (2) raster displays that enable increased front lighting of interlaced images in the displays, and (3) raster displays that enable the front projection of images on the displays. In contrast to the present invention, however, Gundlach does not teach or suggest an apparatus that can display billboard sized images that are perceived as 3D by a viewer, without the use of lenticular lenses and similar optical elements.

Gundlach describes several alternative arrangements. With reference to figure 1, for example, Gundlach describes a three-dimensional photograph 10 including a transparent spacer 12 having a raster pattern 14 on one side and an interlaced image 20 on the other side. The raster pattern 14 has parallel lineations of alternately opaque portions 16 and optically clear portions 18.

The opaque portions 16 may be formed from a series of wedge-shape structures, for example, each having an opaque portion 22 and an optically clear portion 24 (see column 5, lines 36 to 53, and figures 1 and 1a). While a person viewing the image 20 sees opaque lineations (opaque portions 22), light can still be transmitted into the structure through the clear portions 24 of the portions 16 so as to increase the front illumination of the image 20 in brighter ambient conditions. Alternatively, the opaque portions 16 may be in the form of fixed or adjustable vertically angled louvers (see column 5, lines 62 to column 6, line 23, and figure 2a), or

horizontally angled louvers (see column 6, lines 23 to 29, and figure 2b), or plain, optically opaque structures 50 (see column 6, lines 29 to 64, and figures 3 and 4), or hood members 62 that house tubular florescent lights 66 for illuminating the image (see column 7, lines 14 to 17, and figure 5), or opaque portions 88 having a reflective surface on the spacer side of the rastor structure 86 (see column 8, lines 64 to column 9, line 5, and figures 7, 7A and 7B).

The optically clear portions 18 may be lenticular lens structures (see column 5, lines 20 to 21, and figure 1), or flat index gradient lenses 54 such as self-focusing lenses or hollow graphic optical elements (see column 6, lines 46 to 64, and figure 4), or reversed lenticular elements or other transparent structures (see column 11, lines 1 to 15, and figures 12 and 12a).

Gundlach describes rastor display devices that principally seek to increase the amount of light on the front of the image: "The structure is light enhanced by providing internal or external structure portions that enable more light to enter or internally reflect within the structure without impairing the view" (column 2, lines 46 to 49).

Erbey seeks to provide apparatus for displaying full spectrum, full-motion, stereoscopic images, without the requirement for special polarized glasses. In contrast to the present invention, however, Erbey does not teach or suggest an apparatus that can display billboard sized images that are perceived as 3D without the viewer being geometrically aligned with the apparatus and the apparatus successively displaying complementary images through changing apertures.

Erbey describes a device for a stereoscopic display having a grid pattern across its surface and arranged to display a plurality of stereographic pairs to left eye and right eye viewpoints. Two complementary interlaced images (corresponding to first and second frames) are created by interlacing columns of pixels from respective images representative of the two viewpoints.

A masking screen having first and second groups of alternating vertical apertures is placed between the device and a viewer.

When the device displays the first frame, the first group of apertures is open and the second group of apertures is closed, so that the left eye of the viewer is only able to view the columns of pixels displaying the left eye view point and the right eye is only able to view the columns of pixels displaying the right eye view point. When the device displays the second (or succeeding) frame, the first group of vertical apertures is closed and the second set of vertical apertures is open, so that the left eye of the viewer is only able to view the columns of pixels displaying the right eye view point and the right eye is only able to view the columns of pixels displaying the left eye view point.

Each of the successively displayed first and second frames display a stereoscopic image of low (one-half) resolution. During each succeeding frame, the open apertures are closed and the closed apertures are opened, and the complementary interlaced image is displayed. The two high resolution full spectrum viewpoints are presented to the viewer to create a high resolution, three-dimensional stereoscopic display (see column 3, lines 14 to 25).

Erbey discusses the "necessary" geometric relationship between the display, the masking screen and the left and right eyes of the viewer at column 5, line 22 to column 6, line 13 with reference to figure 4. The aperture width (A) the opaque width (W) of the masking screen, and the screen distance (S) between the display screen and the masking screen, are dependent on the number of pixels or columns (P), the overlap area (O), the desired viewing area (D) and the viewer's distance from the screens (V). Erbey teaches that the two viewpoint system "lends itself quite readily to an individual display system such as virtual reality goggles, where the necessary geometric alignment can be easily controlled and maintained" (column 6, lines 63 to 67).

Erbey also discusses increasing the number of viewpoints, and correspondingly increasing the number of interlaced images and the frame rate, to achieve a holographic display that creates a three-dimensional image. The holographic display allows for limited relative movement of the viewer towards and away from the screen, subject to still maintaining basic geometric relationships discussed at columns 5 and 6.

Present invention

In the present invention, an apparatus for displaying 3D images to a viewer includes an enclosure and a frame installed in the enclosure. An interlaced image is installed in the frame behind an optical barrier. A plurality of images is interlaced to form the interlaced image, with strips from the plurality of images arranged adjacently to form the interlaced image. Each of the plurality of images has a plurality of strips. The interlaced image has a plurality of sets of the strips, with each set including a strip from each of the plurality of images. The first strip from each image is arranged in the interlaced image to form one set. The second strip from each image is arranged adjacently in the interlaced image to form a second set. Subsequent strips can be adjacently arranged in the interlaced image to form subsequent sets, so as to form an entire interlaced image assembled from adjacently arranged sets of strips from the images. The optical barrier includes parallel elongated grills spaced from the frame and adapted to obscure portions of the interlaced image. The interlaced image is able to be viewed by a viewer through parallel elongated gaps between adjacent grills.

In contrast to Gundlach and Erbey, in the present invention an interlaced image installed in the frame in conjunction with the claimed optical provide a simple solution for displaying 3D images to a viewer viewing the image through the gaps between the grills of the optical display, without the need for lenticular and gradient lenses and without the need for viewing equipment

such as goggles. A viewer moving laterally past the optical barrier and viewing the interlaced image through the gaps perceives that they are viewing an image at different angles. This unexpected visual effect enables 3D billboard-size images, for example, to be simply and cheaply displayed to viewers. In a typical 6 metre wide billboard embodiment of the present invention, for example, it has been found that an interlaced image can be viewed in 3D by a viewer moving from a minimum of 5 meters to the limit of the viewer's vision away from the billboard.

The present inventors surprisingly found that an installed interlaced image in conjunction with the optical barrier display 3D images when the grill width to gap width ratio of the optical barrier is 80:20 with a variance of up to 5%, and at least part of one strip of the installed interlaced image and at least part of an adjacent strip can be viewed by a viewer through each gap at any one time. A viewer moving laterally past the optical barrier and viewing the interlaced image through the gaps perceives that they are viewing an image at different angles. The resulting visual effect enables 3D images to be displayed on a billboard or like device, for example, to viewers moving past the billboard without the use of lenticular lens or other optical elements.

Accordingly, it can be seen that the functionality of the features defined in amended claims 38 to 41 is not identical to that of Gundlach as suggested by the Office, and that the claimed invention is far more than the optimization of specific dimensions and proportions. As indicated above, Gundlach only discusses using lenticular lenses and other optical elements to display 3D images. Nowhere does Gundlach discuss the presently claimed effect where a viewer can see more than one strip of an interlaced image through each grill, so as to create a visual

perception that they are viewing the image in 3D without using lenticular lenses and other optical elements.

Further, the claimed grill width to gap width ratio of 80:20 with a variance of up to 5% is not the result of ornamental design. The claimed ratio is related to the working of the claimed apparatus and the resultant 3D effect. In the preferred billboard embodiment, for example, the claimed 3D effect is unlikely to be created in billboards having a ratio outside the claimed range. Further, the claimed grill width to gap width ratio of 80:20 with a variance of up to 5% is not the result of routine experimentation. Gundlach makes no reference to any ratio or formula for the clear viewing and opaque portions of the described raster. Further, Gundlach provides no motivation to try the claimed ratio, as the raster displays of Gundlach for displaying 3D images incorporate lenticular lenses and other optical elements.

Unlike the present invention, Gundlach does not seek to provide an apparatus that is able to display 3D images without the use of lenticular lenses or other optical elements. Nor does Gundlach contemplate how a 3D image can be shown without lenticular lenses or other optical elements. In consequence, there is no motivation from Gundlach to consider the grill width to gap width ratio, and therefore nor is there any suggestion or reason to reasonably expect from Gundlach that the claimed ratio could produce the presently claimed 3D effect without lenticular lenses or other optical elements.

4. New Claims 48-57.

Some additional comments regarding new claims 48-57 are provided below.

New claim 49 has been added to recite that each grill is substantially solid so as to restrict light entering or escaping the enclosure through the optical barrier other than through the gaps. Support for new claim 49 can be found in the description and drawings generally.

New claims 50 and 51 have been added to correspond to cancelled claim 32. Support for claims 50 and 51 can be found, for example, in cancelled claim 32 or at paragraph [0010].

New claim 52 has been added to recite that at least one strip of an installed interlaced image and at least part of a first adjacent strip and at least part of a second adjacent strip can be viewed by a viewer through each gap at any one time. Support for claim 52 can be found, for example, at paragraphs [0033] and [0035] and in figures 6A to 6D.

New claim 53 corresponds to cancelled claim 38. Support for claim 53 can be found, for example, in cancelled claim 38, figures 6A to 6D or at paragraph [0012].

New claim 54 recites that the enclosure is arranged to tautly hold a flexible material to which an interlaced image is applied. Support for claim 54 can be found, for example, at paragraph [0026]. At paragraph [0026], the image is described as being able to be applied to a flexible material in the form of a canvas. The canvas is able to be stretched over and installed on the frame. A locking system holds the image taut. As discussed at paragraph [0039], as there may be some stretch in the canvas when held tautly, a mathematical stretch analysis prior to producing the image may be appropriate to enable any stretch of the material (and correspondingly the interlaced image) to be compensated for. Gundlach does not disclose that the interlaced image may be applied to a flexible material. Nor does Gundlach contemplate the associated stretch analysis. In contrast, in Gundlach the image is fixed or mounted to a surface of a space (see column 8, line 14), or projected from in front of the raster.

New claim 55 recites that the frame holds a television screen or other viewing media for displaying an interlaced image. Support for claim 55 can be found, for example, at paragraph [0030].

New claim 56 recites:

An apparatus for displaying images comprising:

an enclosure;

a frame installed in the enclosure and adapted to hold an interlaced image;

an interlaced image installed in the frame, the interlaced image being defined a plurality of images, each of the plurality of images being defined by a plurality of strips, the interlaced image being defined by a plurality of sets of the strips, each set including a strip from each of the plurality of images, and

an optical barrier including a plurality of substantially parallel elongated grills spaced from the frame and adapted to obscure portions of the interlaced image, the grills being arranged to define a plurality of substantially parallel elongated gaps between adjacent grills through which portions of the interlaced image can be seen;

wherein at least part of one strip of an installed interlaced image and at least part of an adjacent strip can be viewed by a viewer through each gap at any one time, so that the installed interlaced image in conjunction with the optical barrier display 3D images to the viewer.

As discussed above, Gundlach does not disclose at least part of one strip of an interlaced image and at least part of an adjacent strip can be viewed by a viewer through each gap at any one time.

As discussed above, the interlaced image in conjunction with the optical barrier display 3D images when the grill width to gap width ratio of the optical barrier is 80:20 with a variance of up to 5%, and the width of the strips is such that at least part of one strip of the installed interlaced image and at least part of an adjacent strip can be viewed by a viewer through each gap at any one time. A viewer moving laterally past the optical barrier and viewing the interlaced image through the gaps perceives that they are viewing an image at different angles.

The resulting visual effect enables 3D images to be displayed on a billboard or like device, for example, to viewers moving past the billboard without the use of lenticular lens or other optical elements.

Nowhere does Gundlach discuss the claimed effect where a viewer can see more than one strip of an interlaced image through each grill, so as to create a visual perception that they are viewing the image in 3D without using lenticular lenses and other optical elements. Nor does Gundlach contemplate how a 3D image can be shown without lenticular lenses or other optical elements.

In view of the above, it is respectfully submitted that claim 56 is both novel and inventive in view of Gundlach.

New claim 57 recites:

An apparatus for displaying an image comprising: an enclosure;

a frame installed in the enclosure and adapted to hold an interlaced image; and

an optical barrier including a plurality of substantially parallel elongated grills spaced from the frame and adapted to obscure portions of an installed interlaced image, the grills being arranged to define a plurality of substantially parallel elongated gaps between adjacent grills through which portions of the installed interlaced image can be viewed by a viewer, a ratio of grill width to gap width being about 80:20 with a variance of up to 5%;

wherein each grill is substantially solid so as to substantially restrict light entering or escaping the enclosure through the optical barrier, other than through the gaps, so that the interlaced image in conjunction with the optical barrier displays 3D images to a viewer.

New claim 57 recites a ratio of grill width to gap width of about 80:20 with a variance of up to 5%. As discussed above, Gundlach does not disclose or suggest the claimed ratio. Nor is

this ratio the result of ornamental design or routine experimentation. Rather, the 80:20 ratio contributes to creating a 3D effect for the viewer, without lenticular or other elements. Such an effect is neither taught nor suggested in Gundlach. For at least that reason we submit new claim 57 is patentable distinguished from Gundlach.

Further, new claim 57 also recites that each grill is substantially solid so as to substantially restrict light entering or escaping the enclosure from in front of the installed interlaced image, other than through the gaps. Gundlach principally seeks to increase the amount of light on to the front of the image. In contrast, embodiments of the present invention seek to avoid any light impinging on front of the image or reflecting off the opaque grills, which hampers visibility of the image through the gaps (see paragraph 0031). This is a significant departure from the teachings of Gundlach.

5. Miscellaneous Issues

Claim 32 was rejected under 35 USC §112 for including the term "such as anodized aluminum." Claim 32 has been cancelled from the application.

6. Conclusion.

For the reasons set forth above, the amended application is believed to be in a condition for allowance. Reconsideration of the application is therefore respectfully requested.

Respectfully submitted,

By 
Timothy N. Thomas, Reg. No. 35714
Woodard, Emhardt, Moriarty, McNett & Henry LLP
111 Monument Circle, Suite 3700
Indianapolis, Indiana 46204-5137
Telephone: (317) 634-3456 Fax: (317) 637-7561
Email: thomas@uspatent.com